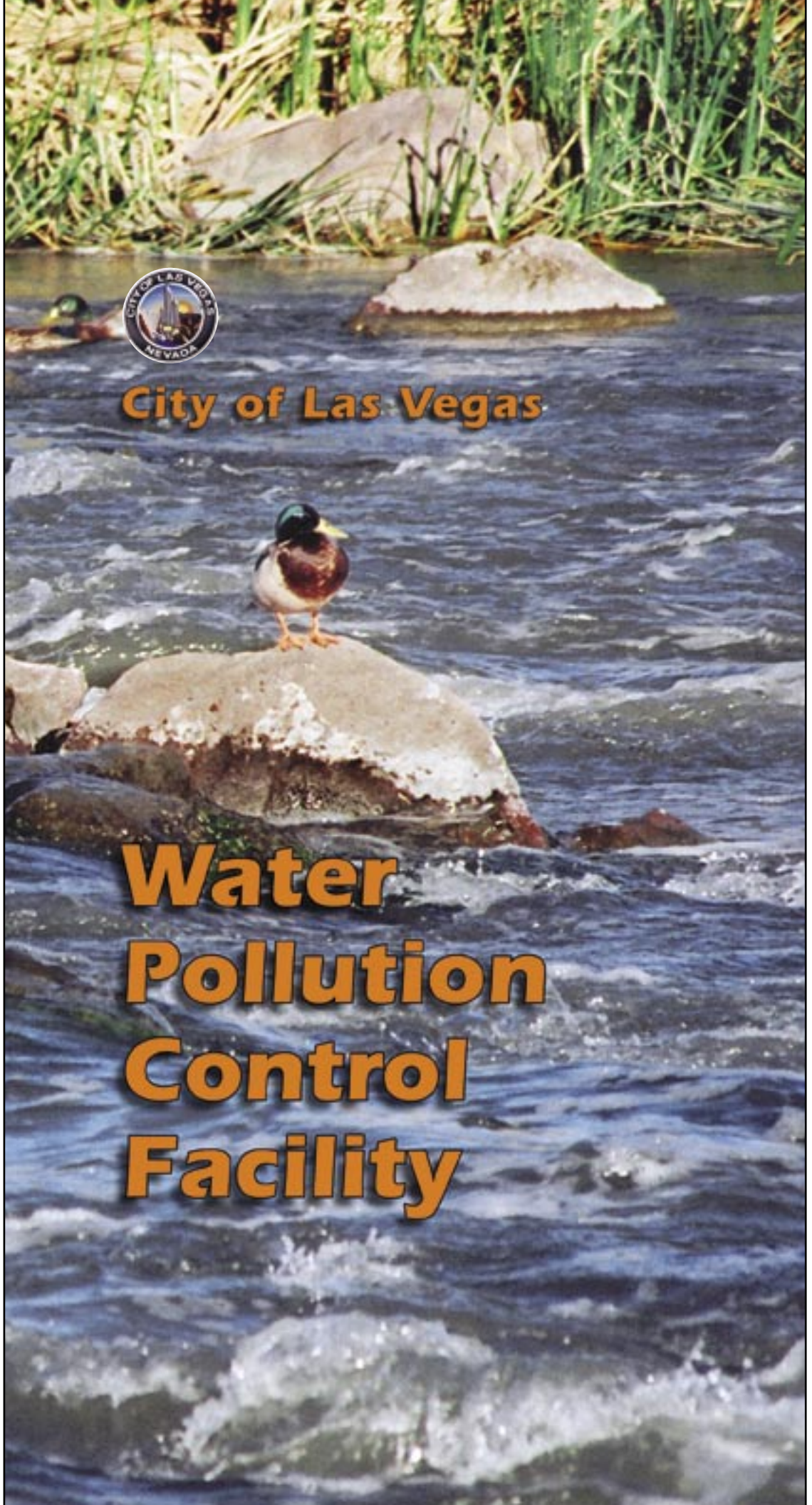
City of Las Vegas
Water
Pollution
Control
Facility

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As part of the City's commitment to being a good community neighbor, Water Pollution Control Facility trickling filters are covered to control odor.

Milestones in History

Today's state-of-the-art wastewater treatment facility is a far cry from Las Vegas' early system.

1912 – The first sewage system in Las Vegas links the streets of Fremont, Main, 5th, Clark, Lewis and Stewart, and ends on the outskirts of town, with a pipe discharging into the desert near Bonanza Road and 9th Street.

1931 – The first wastewater treatment plant is built at 15th Street and Harris Avenue. The plant boasts a capacity of one million gallons per day or, in wastewater treatment terminology, "1 MGD."

1941 – As Las Vegas grows, the plant moves farther east to a site at Eastern Avenue and Harris Avenue.

1948 – A new 7.5 MGD plant is built at Manning Street and Harris Avenue.

1955 – The City of Las Vegas purchases 160 acres of land for today's site on Vegas Valley Drive.

1958 – The first wastewater treatment unit at the City's new Water Pollution Control Facility goes into operation.

1968 – A second separate wastewater treatment unit comes on line, expanding capacity to 30 MGD.

1981 – Additional chemicals are introduced into the disinfection treatment mix. Plant capacity increases to 41 MGD.

1991 – Plants Three and Four come on line, increasing capacity to 66 MGD.

1994 – The new filtration facility comes on line. Later this year, the new activated sludge plant is put into service to meet stricter permit limits, as needs increase.

1997 – Sodium hypochlorite replaces chlorine gas for wastewater disinfection and this eliminates the need to store gaseous chlorine on site.

1999 – Ferric chloride replaces alum as a flocculant. This results in savings on chemicals and decreased odors.

2003 – As one of the nation's fastest growing metropolitan areas, the need to increase capacity continues. Using the innovative Biological Nutrient Removal method, capacity is increased with less chemical costs.

2004 – The Water Pollution Control Facility treats an average of 63 MGD, with the capacity to treat up to 91 MGD.

Making the best use of Water Reuse

April 1999 – The City of Las Vegas completes Southern Nevada's first dedicated water reuse facility. This 1 MGD satellite facility is located on Mojave Road near Bonanza Road, approximately six miles west of the City's main facility. Reuse water produced here is used to irrigate a nearby golf course.

May 2001 – The City of Las Vegas teams up with the Las Vegas Valley Water District to open the Durango Hills Water Resource Center. This 10 MGD water reuse facility is located at 3271 North Durango Drive and provides reuse water to irrigate the City's Durango Hills Golf Course and many other golf courses in the northwest. With operations that are under ground and under cover, the award-winning Water Resource Center exemplifies the City's commitment to being a good community neighbor.

Planning for Tomorrow

Southern Nevada's unprecedented population growth, combined with the dynamic nature of permitting requirements, means Environmental Division staff must continually look ahead to meet future needs. Since 1989, more than $170 million has been spent to improve and expand wastewater treatment processes and more than $30 million has funded projects to eliminate odors generated at the Water Pollution Control Facility.

Purpose

The City of Las Vegas Water Pollution Control Facility treats wastewater generated by more than 650,000 residents and businesses in Las Vegas and North Las Vegas, to meet and exceed discharge permit standards. The cities of Henderson and Boulder City, and unincorporated areas of Clark County, Nevada are each served by separate treatment plants.

Funding

Water Pollution Control Facility funding is provided by system user charges and sewer connection fees.

Goals

Water Pollution Control Facility staff goals are to:

Meet discharge permit limits

The Nevada Division of the Environmental Protection Agency (NDEP) issues a "Permit to Discharge" to the Water Pollution Control Facility (WPCF). Plant staff treats and monitors the discharge or "effluent" 365 days a year. Helping to ensure that the City of Las Vegas meets its permit to discharge, the Environmental Division issues Wastewater Control Permits to Las Vegas businesses. WPCF staff monitors the wastewater discharge of these businesses to prevent toxic chemicals from entering the plant and possibly passing through the plant.

Optimize plant performance

By looking for ways to become more efficient, increase employee proficiency and make improvements to the physical plant, staff strives to economize wastewater treatment.

Maintain a safe work environment

Dedicated employees make the Water Pollution Control Facility safe for workers, visitors and neighbors. Procedures are in place to ensure safe chemical handling and safe equipment repairs. Training programs are ongoing, with emphasis on safety facets and a Safety Committee meets regularly to address safety concerns.

Be a good neighbor in the community

Significant measures have been taken to reduce odors through chemical addition, by eliminating the use of sludge drying beds, and by covering the early stages of the treatment process. As residential development continues to expand and move closer to the WPCF, staff is challenged to explore economical ways to implement even more odor improvements. Projects coming on line now and in the future include odor reduction as an important component of design and construction, in order to remain a good community neighbor.

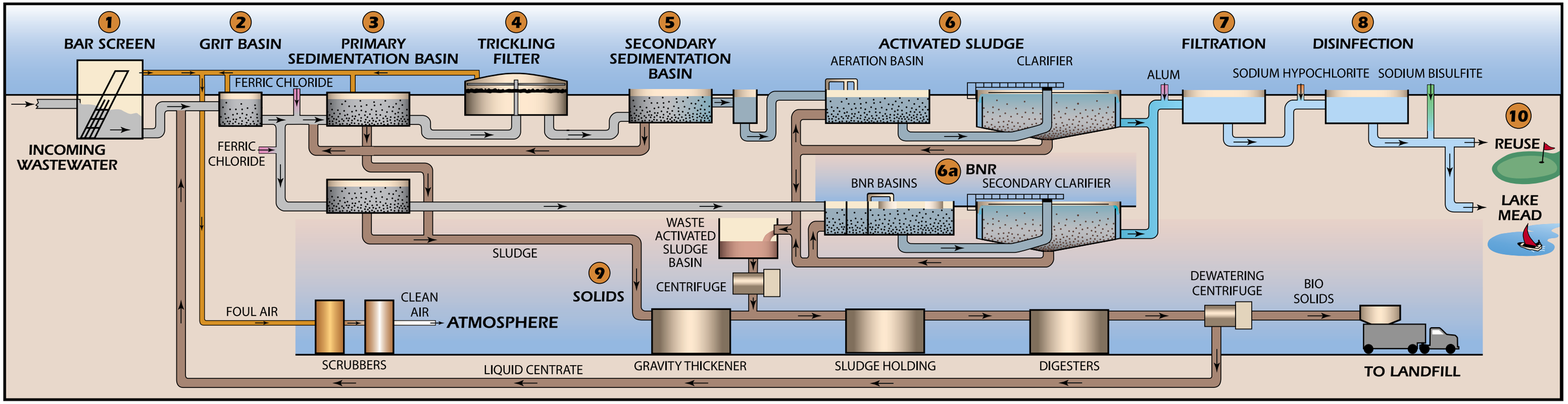
Lake Mead Monitoring

The City of Las Vegas, in conjunction with other dischargers to Lake Mead, collectively monitors the water quality of the lake to ensure that the discharge does not adversely impact downstream users. The City of Las Vegas is responsible for conducting water quality sampling and does thousands of physical readings of Lake Mead each year. The Environmental Division maintains a boat for use at the lake. Laboratory and Industrial Waste staff members make up the Lake Mead Monitoring Crew.

Tour Program

Visitors are welcome to tour the Water Pollution Control Facility. Students from area schools, visitors from around the valley and international visitors from across the globe, tour the complex each year. Upon request, laboratory staff members also do presentations to local schools. For more information regarding tours and presentations, please call (702) 229-6200.

The Treatment Process

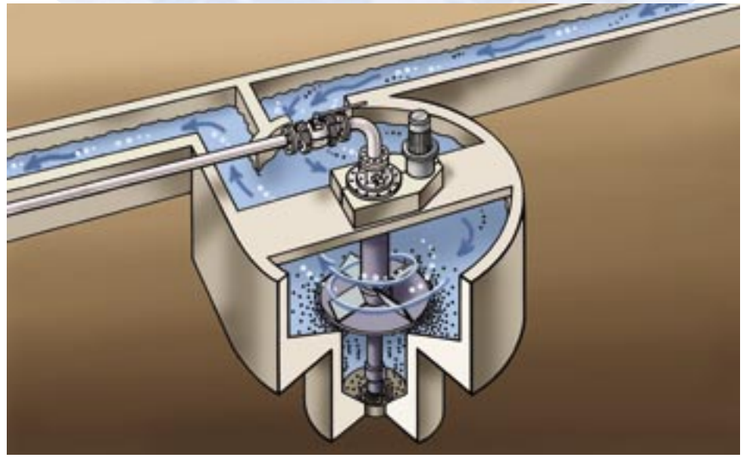


1 Screenings

The plant process starts with the screenings facility. Rags, toy parts, trash and other large items are removed when incoming wastewater or "influent" goes through one of three sets of grids. Each bar screen has a series of vertical bars with ¾-inch spaces between the bars that trap large materials before they can enter the treatment process. An automatic rake cleans off the bars and the flow is then split to six separate plants.

2 Grit Removal

The round grit removal basins have an upper and lower section. Water flows into the upper level. Here, a slow impeller at the bottom of the section keeps lighter materials afloat and moving with the wastewater to the next stage, while allowing heavier items such as rocks, metal and glass, to drop to the lower section past the impeller. These materials are then pumped to a wash station and loaded into a truck to be taken to a landfill. These objects might otherwise damage equipment if not removed.



3 Primary Sedimentation Basins

These rectangular basins are 190 feet long, 40 feet wide, and eight to ten feet deep. The basins are covered for odor control.

After grit removal, flocculants are added before entering the primary basins, and flow is slowed to a rate of two feet per minute. Chemicals and time allow solids to settle. Ferric chloride and polymer, which are the chemical flocculants used, allow finer, lighter particles to clump together into heavier groups and settle, and in some cases, precipitate out. Much of the phosphorus, suspended solids, and organic material are removed during this stage of the process. The sediment is pumped to solids handling areas and the partially treated wastewater proceeds for further treatment.

4 Trickling Filters

After leaving the primary sedimentation basins, the water is pumped to circular trickling filters. The water pours out of holes in a revolving pipe and "trickles" over rocks where microorganisms naturally grow. The microorganisms consume additional organic material.

Trickling filters are about 180 feet in diameter and four to seven feet deep. They, too, are covered to control odor.

5 Secondary Sedimentation Basins

Bacterial growth on the rocks in the trickling filters falls off and is settled out in the secondary sedimentation basins.

Secondary sedimentation basins are the same dimensions as the primary basins.

6 Activated Sludge

An activated sludge plant was built to meet stricter regulations for ammonia nitrogen. Microorganisms are used to convert ammonia nitrogen to nitrate nitrogen in a process called "nitrification." Effluent from the secondary sedimentation basins is pumped into aeration basins where it is mixed with recycled activated sludge that contains microorganisms. Air is supplied through diffusers for mixing, and to provide oxygen that the bacteria need for the nitrification process.

After the aeration basin, the water/activated sludge flows into circular clarifiers, where the activated sludge settles to the bottom, and is returned to the aeration basins and the clear effluent flows over weirs and proceeds to filtration.

6a Biological Nutrient Removal

Biological Nutrient Removal (BNR) is an activated sludge process that operates differently from the nitrification process described above. BNR, alone, can accomplish the functions of trickling filters, secondary sedimentation basins and nitrification. The microorganisms are subjected to conditions that enable them to serve multiple functions.

These include the removal of phosphorus, organic material, ammonia and nitrate. After going through BNR, the flow goes to clarifiers. Here the sludge settles and is returned to the system, while the clear effluent flows over weirs and proceeds to filtration.

7 Filtration Facility

Effluents from the activated sludge processes at Nitrification and BNR are pumped into the filtration facility for tertiary treatment where alum is added to assist in removing the remaining fine particles and phosphorus. The filtration facility has 30 filters.

8 Disinfection

After final treatment, the water is disinfected with sodium hypochlorite. This concentrated bleach solution kills harmful microorganisms. Sodium bisulfite is then added to remove any remaining chlorine prior to discharge to the Las Vegas Wash.

9 Solids

Solids removed from the wastewater go through three steps before they are transported to a landfill. First, the solids are pumped to thickener basins where gravity settling separates water from the thickened sludge.

Next, the sludge is pumped to anaerobic digesters, where bacteria break the thickened sludge down into a more stable form. During this process, enough methane gas is generated to heat the digesters and power some equipment, including blowers that supply air for the activated sludge processes.

Next, digested sludge is pumped to the dewatering facility where water is removed mechanically by centrifuges, yielding the final product called "biosolids."

10 Reuse

Reuse water, produced at the Water Pollution Control Facility, is used at nearby golf courses and at an adjacent power generating plant.

Environmental Division Sections

Administration - Staff coordinates plant activities and manages the budget, construction contracts, personnel, computer support and the safety program.

Engineering - Staff coordinates and monitors engineering and construction contracts at the Water Pollution Control Facility. They provide technical engineering support to the Operations and Maintenance Sections and are responsible for all as-built drawings of plant systems.

Industrial Waste - Staff monitors more than 1,500 businesses to make sure the sewer system is used properly and to prevent prohibited substances from being discharged into the sewers which could harm the wastewater plant and possibly Lake Mead. Pretreatment staff handles the sewer permitting process to help ensure that businesses are aware of what can and cannot be discharged into the sewer system. Staff also collects samples from individual businesses as required, and from various locations throughout Las Vegas.

Laboratory - Staff provides most of the analyses required by the NPDES discharge permit. Many different sampling and analysis functions are performed in support of permit requirements, plant operations, and protection of the environment. Lab personnel are also involved in special projects to meet the needs of the City of Las Vegas and other customers. Hundreds of analyses are performed each day.

Maintenance - Staff maintains, repairs and replaces the physical equipment at the WPCF and two satellite facilities. Crews work on a variety of equipment including pumps, motors, plumbing, instruments, electrical systems, and programmable logic controllers. Proper equipment maintenance is crucial to safe and effective treatment plant operations.

Operations - Staff monitors and controls all treatment processes. This involves establishing chemical dosages, pumping and flow rates, recording and interpreting data, and optimizing plant operations.

Purchasing and Supply - Staff handles materials, parts and supply requests, storage, and deliveries for each division section. Requests range from the routine to the unusual and exotic, and from the immediate to planning six months ahead.

All sections of the Environmental Division work as a team to keep the three plants operating as safely, effectively and efficiently as possible.

What's In YOUR Sewer?

Automotive fluids, gasoline, pesticides, fertilizers, paint, solvents, thinners, acids, caustics, industrial cleaners, hobby supplies, grease and used cooking oil -- to name a few -- should never be allowed to enter the sewer, as they can cause serious and expensive damage to wastewater treatment plants and underground sewer lines. Discharges such as these may also result in overflowing sewer lines in neighborhoods, explosive conditions underneath the roadways, and hazardous working conditions for downstream sewer workers. It is also illegal to dump anything into a storm sewer, as this can create unsafe conditions and pollute the environment.

Residents can, however, legally dispose of household hazardous waste at no charge, if it is taken to the valley's household hazardous waste drop-off facility. For added convenience, used motor oil can be set out with curbside recycling, if it is labeled as such and poured into gallon-sized plastic containers, with secure lids.

It is against the law for anyone to discharge anything directly into a street manhole. To report illegal dumping, please contact the Industrial Waste Section at (702) 229-6594.

Glossary of Terms

Alum A chemical, aluminum sulfate, which is added to wastewater to cause floccing of solids.

Anaerobic digestion The use of bacteria in an anaerobic (without oxygen) environment to break down wastewater solids to make a mixture that produces less odor and is easier to separate from the water. An important by-product is methane gas, which is used to heat the digesters and power air blowers.

Centrate Liquid removed from sludge during one of the solids concentrating steps.

Disinfection Generally the last step in water treatment. The WPCF uses chlorine in the form of hypochlorite to disinfect. This is done to remove any pathogens that may have survived the treatment process. An indicator organism is tested to check whether adequate disinfection has occurred.

Effluent Treated wastewater that leaves a process or the plant.

Flocculation The clumping of fine or dissolved particles into large particles by the addition of alum or polymer to aid in their removal from wastewater.

Ferric chloride A chemical which is added to wastewater to improve solids settling, precipitate phosphorus, and reduce odors.

Influent Untreated wastewater that flows into a process or the plant.

NPDES National Pollutant Discharge Elimination System.

Nitrification The conversion of ammonia to nitrate by aerobic bacteria in activated sludge treatment processes at the WPCF. Nitrification is important and desirable because ammonia is harmful to fish.

Nitrogen Ammonia and organically bound nitrogen are common in wastewater and, like phosphorus, nitrogen can contribute to the growth of organisms in receiving waters.

Phosphorus Phosphorus removal is an important part of the treatment system. Phosphorus is an essential nutrient for the growth of organisms and can be beneficial in a fertilizer or it can stimulate nuisance organisms (algae) when discharged in large quantities into a river or lake.

Polymer A chemical with a very long chain structure which is used in addition to alum to floc particles in wastewater.

Scrubber Used to eliminate odor causing chemicals, especially hydrogen sulfide. Contaminated air is passed up through a tank containing plastic media, as neutralizing chemicals trickle down over the media.

Sludge Term for the material removed from wastewater during treatment which undergoes a separate treatment process before being transported to a landfill.

Tertiary treatment Refers to the most advanced levels of wastewater treatment, usually to remove specific substances.

Award Winning Recognition

The Environmental Division of the Public Works Department has been recognized for many award-winning accomplishments.

2004 – Association of Metropolitan Sewerage Agencies Platinum Peak Performance Award for five consecutive calendar years, 1999 to 2003, of complete compliance with the National Pollutant Discharge Elimination System permit at the Water Pollution Control Facility

2003 – Nevada Division of Environmental Protection Wendell McCurry Excellence in Water Quality Award for efforts to improve water quality through the voluntary reduction of phosphorus discharges to Lake Mead

2002 – American Council of Engineering Companies of Nevada's highest recognition, the Grand Conceptor Award, for the design of the Durango Hills Water Resource Center

2002 – Association of Metropolitan Sewerage Agencies Gold Peak Performance Award for complete compliance in a calendar year with the National Pollutant Discharge Elimination System permit at the Water Pollution Control Facility

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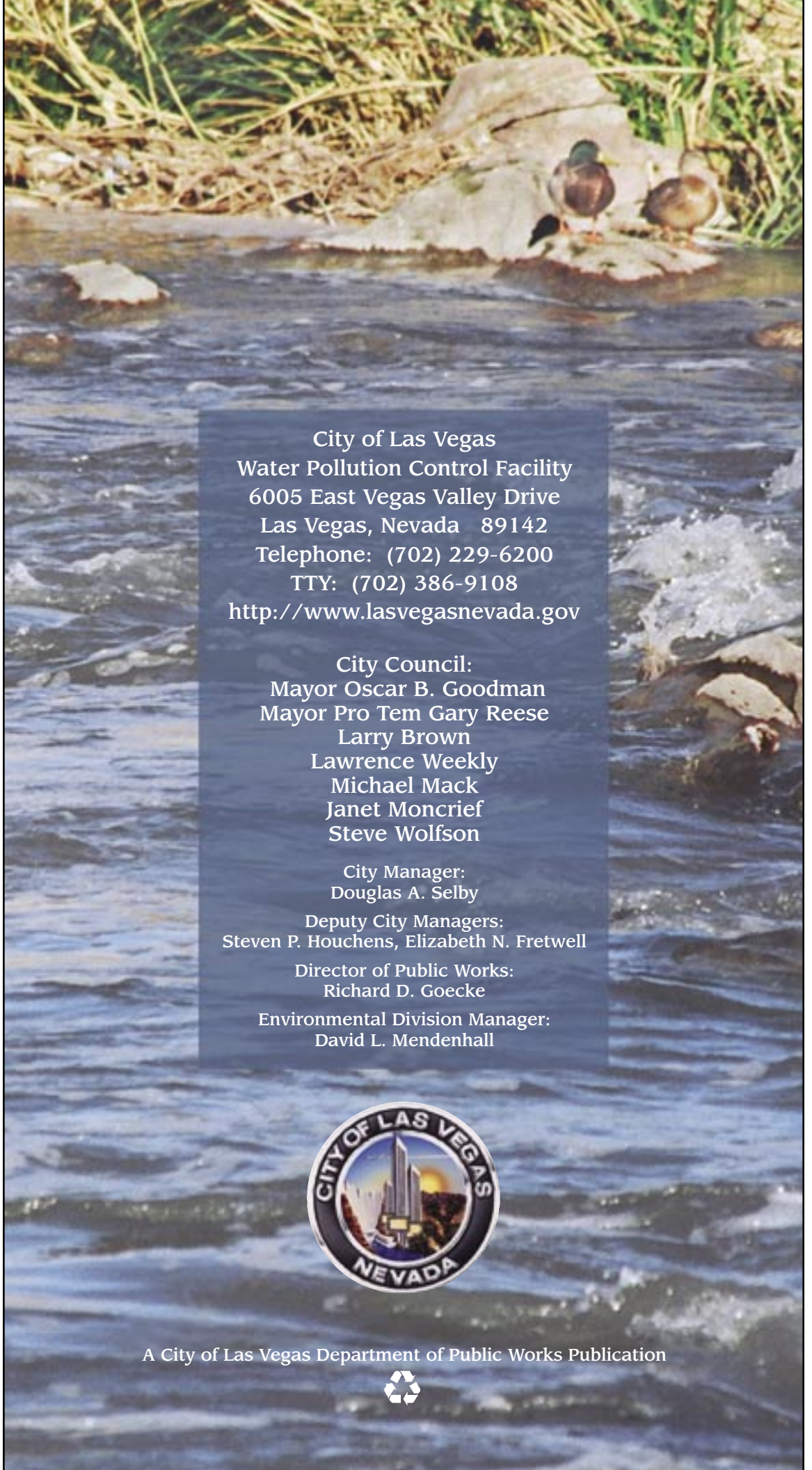

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